

The Leaf-Miners of *Pipturus* (Lepidoptera).

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(Presented at the meeting of January 5, 1922.)

The mamake tree, *Pipturus albidus*, is endemic to the Hawaiian Islands. It occurs in the forests of all the large islands of the group, and is one of the trees which supports a considerable insect fauna, as shown by a paper on the subject in Proceedings Hawaiian Entomological Society, II, p. 153, 1912. At that time the leaf-miners attacking this tree were not so well known as now, but one species being mentioned, and, as it turns out now, was incorrectly determined.

Now that the leaf-miners of *Pipturus* have been more thoroughly studied, it is found that there are several species, some of which closely resemble one another, but occur in different localities or on different islands, illustrating the production of species by geographic isolation.

These leaf-miners all belong to the Lepidopterous family Tineidae. At present six species are recognized, and no doubt others will be found by further collecting in regions where no particular attention has been given to these insects.

Philodoria micropetala Walsm.

Fauna Hawaiensis, I, p. 719, Pl. XXV, fig. 22, 1907.

This species was described from a single specimen collected at Halemanu, Kauai. I collected specimens of it on *Pipturus* trees at Kokee (which is near Halemanu), on August 23, 1921. The trees had mined leaves, and I consider that the mines belonged to this moth. It is found that the specimens agree with the figure and Walsingham's description of *micropetala*. That being the case, all of my previous references in Proceedings Hawaiian Entomological Society to this species occurring on Oahu as a leaf-miner in *Pipturus* are in error, as the Oahu species is not the same as these Kauai specimens. I determined specimens from *Pipturus* on Oahu by comparison with the figure of *micropetala*, and as they nearly agreed, and as there were no other near related species known at the time, I felt that prob-

ably there might be variation enough to account for the difference between my specimens and the figure.

In Proc. Haw. Ent. Soc., II, p. 222, 1913, I stated that *micropetala* (the species which was mistaken for it) occurred on all the Islands. The leaf mines that had been found in *Pipturus* up to that time, I had taken to be all of the same species of moth. Since then I have discovered several other species in different places by rearing them from the mines in the leaves.

Philodoria floscula Walsm.

Fauna Hawaiiensis, I, p. 718, Pl. XXV, fig. 21, 1907.

This species was described from Hilo and Olaa, Hawaii. I have collected it on *Pipturus* at Mountain View, Hawaii, March 31, 1906.

Philodoria pipturicola Swezey.

Proceedings Hawaiian Entomological Society, III, p. 96, 1915.

This species was reared from mined leaves collected from *Pipturus* in the forest above Punaluu, Oahu, September 13, 1914, and above Wailuku, Maui, December 9, 1922.

Philodoria pipturiella n. sp.

Antennae brownish; palpi white inwardly, externally brownish at apical portion of median and terminal joints; head and thorax grayish brown. Fore-wings bronzy brown, costal margin narrowly white to about two-thirds, where a white spot projects inward, pointing obliquely outward; sometimes the white on costa extends only half-way to this spot; a large nearly circular white spot in middle of wing at about one-third the fold which traverses its center; a large white spot at tornus, an orange spot opposite it on costa, narrowly separated from it by a metallic blue patch which widens apically; beyond the blue patch a large orange patch occupies the remaining apical portion of the wing except a small apical black spot followed by metallic blue in the apical cilia; cilia otherwise brownish, with two white spots in the costal cilia above the orange patch. Expanse of wings 5-6 mm. Hind-wings brownish as in fore-wings, cilia paler brown. Abdomen bronzy brown, whitish beneath. Legs pale brownish, whitish beneath.

Holotype in collection of Hawaiian Entomological Society. Paratypes in author's collection, and the collections of the Bishop Museum and Experiment Station of the Hawaiian Sugar Planters' Association.

Hab.—Oahu: practically the whole island wherever *Pipturus*

grows. I have reared it many times from mines in *Pipturus* leaves collected at various places in the S. E. Koolau Mountains: Palolo, Kaumuahona, Tantalus, and Pacific Heights, and also from Mount Kaala and Makaleha, in the Waianae Range. The large leaves of *Pipturus* often contain great numbers of the mines, even up to a hundred, but usually the larvae in most of them die or are parasitized so that but few of them reach their full growth and spin cocoons. The cocoons are made on the under side of the leaf alongside a prominent vein, white and not very conspicuous.

Any mention that I have previously made to *micropetala* in the Proceedings of the Hawaiian Entomological Society pertains to this species.

Philodoria pipturiana n. sp.

Antennae pale fuscous, apical portion white. Palpi whitish, streaked with fuscous externally. Head sordid whitish. Thorax dark fuscous, white beneath. Fore-wings dark fuscous to nearly black, with several white markings: a white costal bar outwardly oblique from about middle of costa extends about half-way across wing; another oblique white bar at two-thirds of costa, which recurses to the costa, terminating in a few white scales in the costal cilia; just beyond this is a curved transverse white bar nearly interrupted in the middle, its costal end terminating with a few white scales in the costal cilia (not present in the paratype); a longitudinal white streak on basal third of fold, followed by a large oval white spot about middle of fold; a large oval white spot on dorsum about at end of fold; cilia fuscous except for the white scales previously noted in costal cilia and a few white scales at base of apical cilia. Expanse of wings 8-9 mm. Hind-wings and cilia dark fuscous. Abdomen fuscous. Legs pale fuscous, tarsi white spotted.

Described from two specimens collected on *Pipturus* tree which had leaves containing leaf-miners, on the Upper Hamakua Ditch Trail, Kohala Mountains, Hawaii, July 31, 1921. In color this species resembles *nigrella* from Kilauea and forest above Hilo, Hawaii, but the white markings are distinctly different. The habits of *nigrella* are not known.

Holotype in the collection of the Hawaiian Entomological Society; paratype in collection of the Hawaiian Sugar Planters' Association.

Gracilaria neraudicola Swezey.

Proceedings Hawaiian Entomological Society, IV, p. 385, 1920.
Reared from leaf mines in *Neraudia melastomaefolia* (a tree

near related to *Pipturus*), at Punaluu, Oahu, June 11, 1916, and Waiahole, Oahu, August 13, 1916. Reared from leaf mines in *Pipturus* at Pahoa, Hawaii, September 20, 1918; in the jungle along Volcano Road south of Hilo, Hawaii, July 25, 1921; and at 2000 feet elevation on Judd Trail, Kona, Hawaii, August 14, 1919.

CORRECTION.

My record in Proc. Haw. Ent. Soc., II, p. 222, 1913, of breeding *Philodoria basalis* Walsm. from leaf mines in *Pipturus* leaves in Kohala Mountains, Hawaii, is an error. There is a mistake about it somewhere, for since that time I have ascertained that *basalis* is the leaf-miner in *Metrosideros* or ohia lehua, on Hawaii and Maui.

TABLE OF PIPTURUS LEAF-MINERS.

1. (8) More or less orange at apex of fore-wing.
2. (7) White spot on fold usually not reaching dorsal margin.
3. (4) Apical half of fore-wing with ground color orange.. *P. pipturicola*
4. (3) Much less orange at apex of fore-wing.
5. (6) White spot on fold nearly circular..... *P. pipturiella*
6. (5) White spot on fold semi-circular..... *P. micropetala*
7. (2) White spot on fold, narrow, extending to dorsal margin.
P. floscula
8. (1) Fore-wing not orange on apical portion.
9. (10) Three outwardly oblique white spots extending inward from dorsum of fore-wing..... *G. neraudicola*
10. (9) Oval white spot on dorsum near end of fold..... *P. pipturiana*